

The Knowledge Bank at The Ohio State University
Ohio State Engineer

Title: Natural Gas and its Production

Creators: Burroughs, William E.

Issue Date: May-1930

Publisher: Ohio State University, College of Engineering

Citation: Ohio State Engineer, vol. 13, no. 7 (May, 1930), 6, 20-21.

URI: <http://hdl.handle.net/1811/34697>

Appears in Collections: [Ohio State Engineer: Volume 13, no. 7 \(May, 1930\)](#)

NATURAL GAS AND ITS PRODUCTION

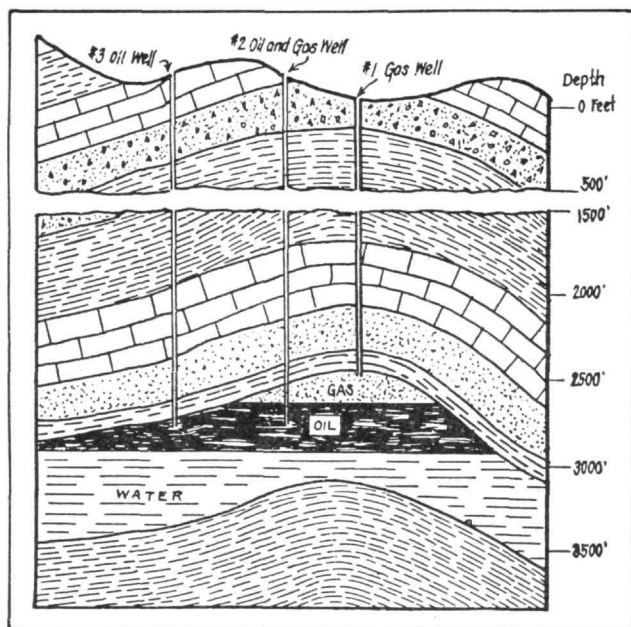
By WM. E. BURROUGHS, C. E. 3

Natural gas was first discovered by the Chinese many centuries ago. It also occurred along the shores of the Caspian Sea in very early times and when it escaped through fissures in the rock and became ignited it was worshipped by the native as a fire god. The earliest record of natural gas in America is 1775 when George Washington dedicated, as a National Park, a tract of land located in what is now West Virginia containing a "burning spring."

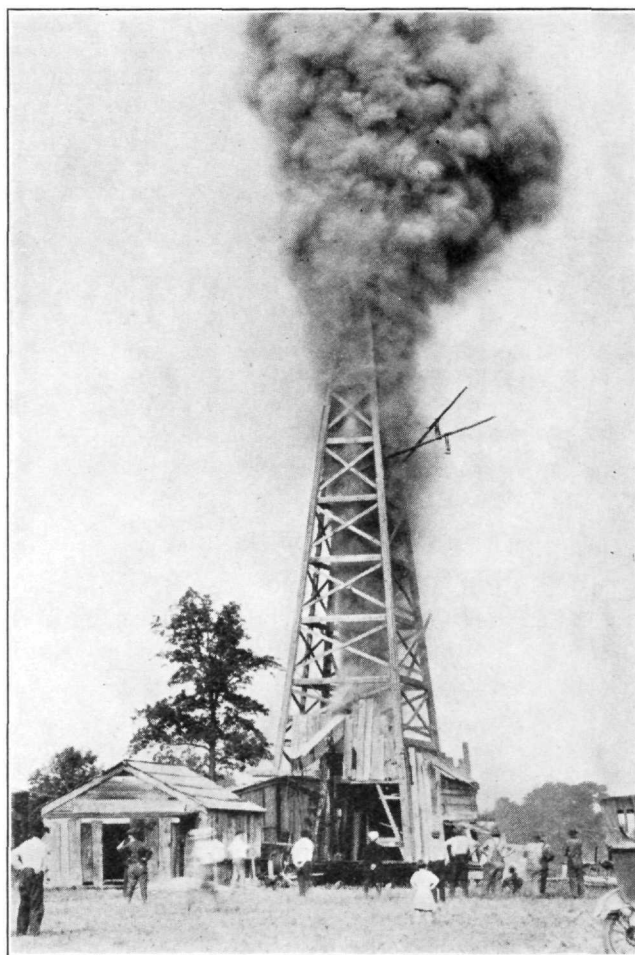
The first natural gas well was completed in 1821 at Fredonia, N. Y., and although it was only 27 feet deep, a supply sufficient for thirty burners was obtained. During the early part of the nineteenth century, many wells, which were drilled for salt along the Muskingum River in Southeastern Ohio, produced natural gas. Natural gas was used for commercial purposes at East Liverpool, Ohio, in 1863 and in 1873 the town of Fairview, Pa., was supplied with gas from a 2-in. pipe five miles long.

The relative inefficient equipment used in the consumption of gas continued to retard the development and growth of the gas industry prior to 1855. At about this time Von Bunsen invented the blue flame gas burner which is still in use, and Auer developed the Welsbach mantle. From the impetus given by these two discoveries, especially the former, the industry has been able to expand steadily until today it ranks among the leading industries of the country.

What is natural gas? Natural gas is principally a mixture of substances called "hydrocarbons," so named because they are combinations of hydrogen and carbon. Small amounts of nitrogen are usually present, while in some localities, carbon dioxide, sulphur compounds and large amounts of nitrogen are present. The hydrocarbons form the combustible portion of natural gas.



Vertical Section of a Typical Gas Field



Drilling in on One of the Cambridge Wells

The producing fields of natural gas in Ohio are scattered over the eastern half of the state. However, a very small portion of the total land included in the eastern half of Ohio actually produces oil or gas. With the exception of Lima and Findlay fields, no production is found in the western half of the state. In all there are approximately 4,500 square miles of actual producing area in Ohio. These areas of gas production are divided into a classification called fields; the most prominent ones being Northern, Mt. Vernon, Sugar Grove, Cambridge, Stewart and Wellston. In some cases, fields have continued to produce for many years. (Without exception, however, the production from any given field declines rapidly and continuously after full development has once been completed. As an example, consider the Cambridge field; this field was rated as an excellent gas field during its development but its production declined so rapidly that many producers lost a considerable proportion of their investment. The accompanying photograph shows the tremendous amount of pressure which was exerted by one of the wells in the Cambridge field at the time of its drilling in. This well was drilled in 1926 and is still producing to some extent, al-

(Continued on Page 20)

NATURAL GAS

(Continued from Page 6)

though its decline in the first year was about 90 per cent of its original production.)

The location of a gas well is determined from field maps which show the locations and volumes of wells in the vicinity. Geologic formations from logs of surrounding wells are also taken into consideration in locating a well. These logs consist of an accurate record of depths, by measurement with steel tape line, and of the different kinds of strata of sands as indicated by the contents of the bailer. The two producing sands in Ohio are the Clinton and Berea sands. The Clinton produces a greater unit volume but is more expensive to reach on account of the greater depth. The Berea sand varies from 400 to 2,400 feet in depth and the Clinton from 1,900 to 4,200 feet.

In preparation for the drilling, a drilling rig is moved to or built on the location as established by an engineer. A standard drilling rig is 81 feet high, usually constructed of iron or steel (tubular and angle iron) though sometimes of wood. The height of 81 feet is necessary because the string of tools, which is approximately 50 feet long, must work freely within the derrick above ground level. This height is necessary, too, in order that more than one joint of casing or tubing (generally 20 feet long) can be lowered into the well at one time. The power for drilling is generally supplied through the medium of steam or gas engines. This power is transmitted by belts to a band wheel which in turn operates a massive beam termed a "walking beam." This beam is generally made from a large oak timber, and measures about 12"×24"×26', although it is somewhat smaller at each end. The walking beam pivots on its center and one end of the beam is connected to the band wheel in such a manner that with each revolution of the band wheel, the attached end of the beam is alternately raised and lowered. The temper screw, which carries the drilling cable supporting the tools, is attached to the other end of the beam, and the alternating motion of the beam causes the drilling tools to raise and lower in the hole.

The pay or producing sand is usually topped by a hard formation called the "shell." When this shell has been penetrated to the top of the sand, drilling is discontinued and the 6 $\frac{5}{8}$ -in. casing is pulled. Where a production of great pressure is expected, it is customary, before penetrating the sand, to put a control casing head on the top of the casing. A control casing head has a three-way valve through which the drilling tools may be operated until the gas flow makes further drilling impracticable. If the well comes in with the anticipated volume and pressure, the tools are pulled and the valve operated in such a manner as to shut off the gas, pending connection to the line.

In cases where the pay sand is not an open sand, or the production is not large, the well is shot to increase the output. The well is shot with nitro-glycerine and the amount used is determined by the thickness and structure of the sand. If the sand is hard, approximately 80 quarts of nitro-glycerine are required; whereas, if the sand is soft and loose, 40 quarts may be sufficient. After the nitro-glycerine is lowered in the well, a smaller

dynamite shell with a proper length fuse attached to insure it time to reach the bottom before exploding, is dropped in the well. This produces a very violent explosion and if the gas is of paying quality it may shoot to two or three times the height of the derrick.

After a well is brought in, the volume or production of the well is measured. The accumulated gas pressure immediately surrounding the well is first blown off into the air so that the flow from the well comes directly from the sand and not from accumulated gas pockets. When such delivery conditions have been established a U-gage is so placed at the top of the well that it will measure the average dynamic pressure at the top of the casing caused by the flowing gas. The observation equipment usually consists, in part, of a small tube, one end of which is bent at right angles. The open end of this tube is generally held in position about $\frac{1}{3}$ or $\frac{1}{4}$ of the pipe's diameter from the outer edge. The plane of the opening in the tube is held at right angles to and facing the flowing stream of gas. This tube is attached by rubber hose to the U-gage. The U-gage is usually half filled with mercury or water, the mercury being desirable for high velocities and the water being satisfactory for lesser velocities. The dynamic pressure, which is a result of the motion of the gas, furnishes a measure of its velocity.

The drilling of a well is but a small part compared to the work required to distribute the gas to the consumer. The natural gas from the field is connected into lines that in turn converge at a compressor station where the gas is sent to the point of consumption.

It Will Pay You To
Pay Us a Visit

Hyde Park
Suits and Overcoats

\$22.50

In the Latest Models

Shoes---Special

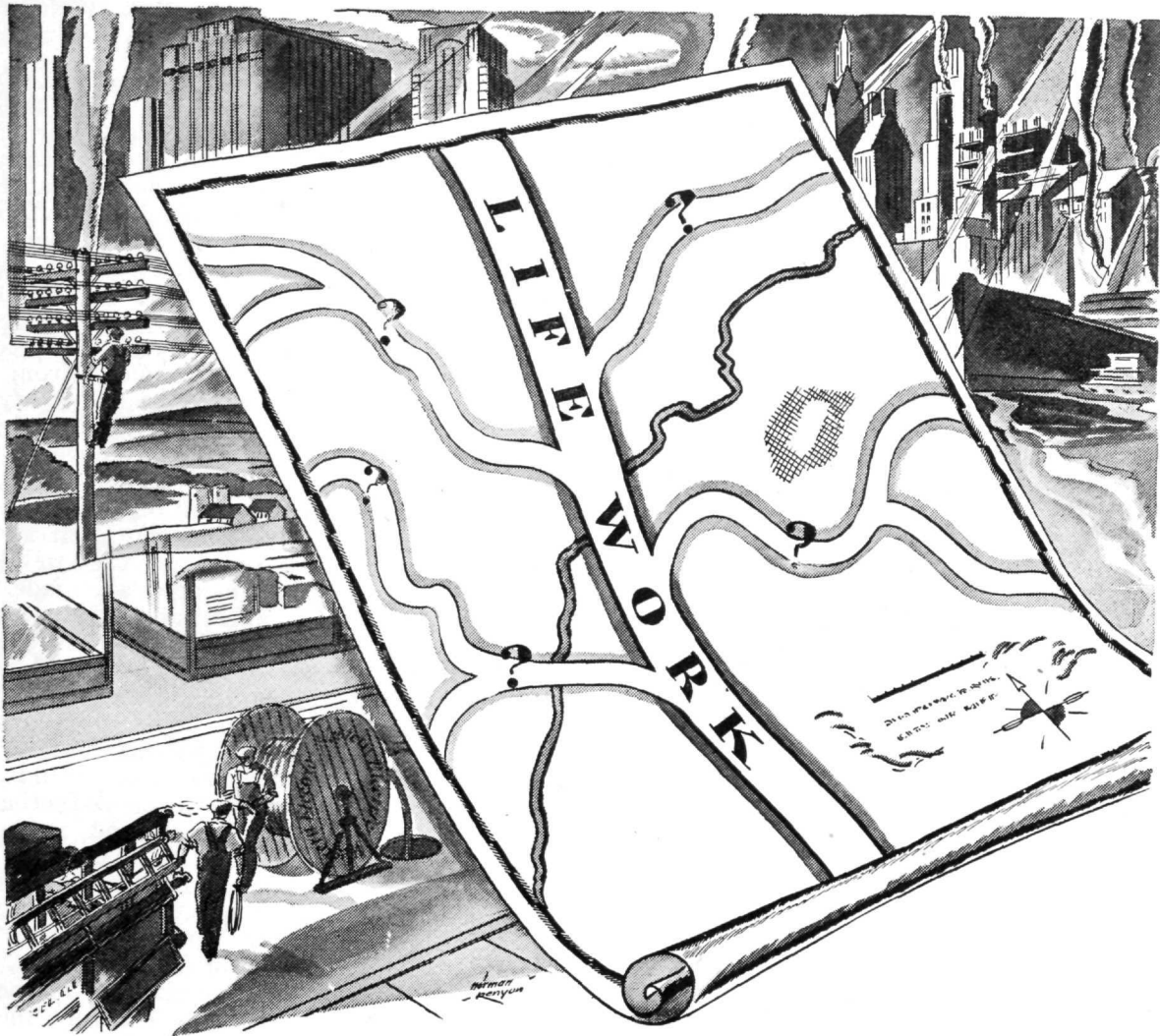
\$4.85 and \$5.85

Furnishings, Etc.

STYLE SHOP

S. E. Cor. High and 11th

Headquarters for Engineers



Map your road through industry *NOW!*

GUESSING the road is bad business when you are starting on your life work.

There are plenty of signs in your physical and mental make-up that will help you to find the right sort of work if you'll only take time to study them. Your likes and

dislikes, your natural aptitudes, all point the way for you to go—getting into creative, statistical, engineering or sales-promotional work... Read these signs before you start out from college! Today, more than ever before, industry requires men who have found themselves.



Western Electric

SINCE 1882 MANUFACTURERS FOR THE BELL SYSTEM
MAY, 1930